All Time Points

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9/26/2019

Multiple Regression 1

Lowest Weigh-in

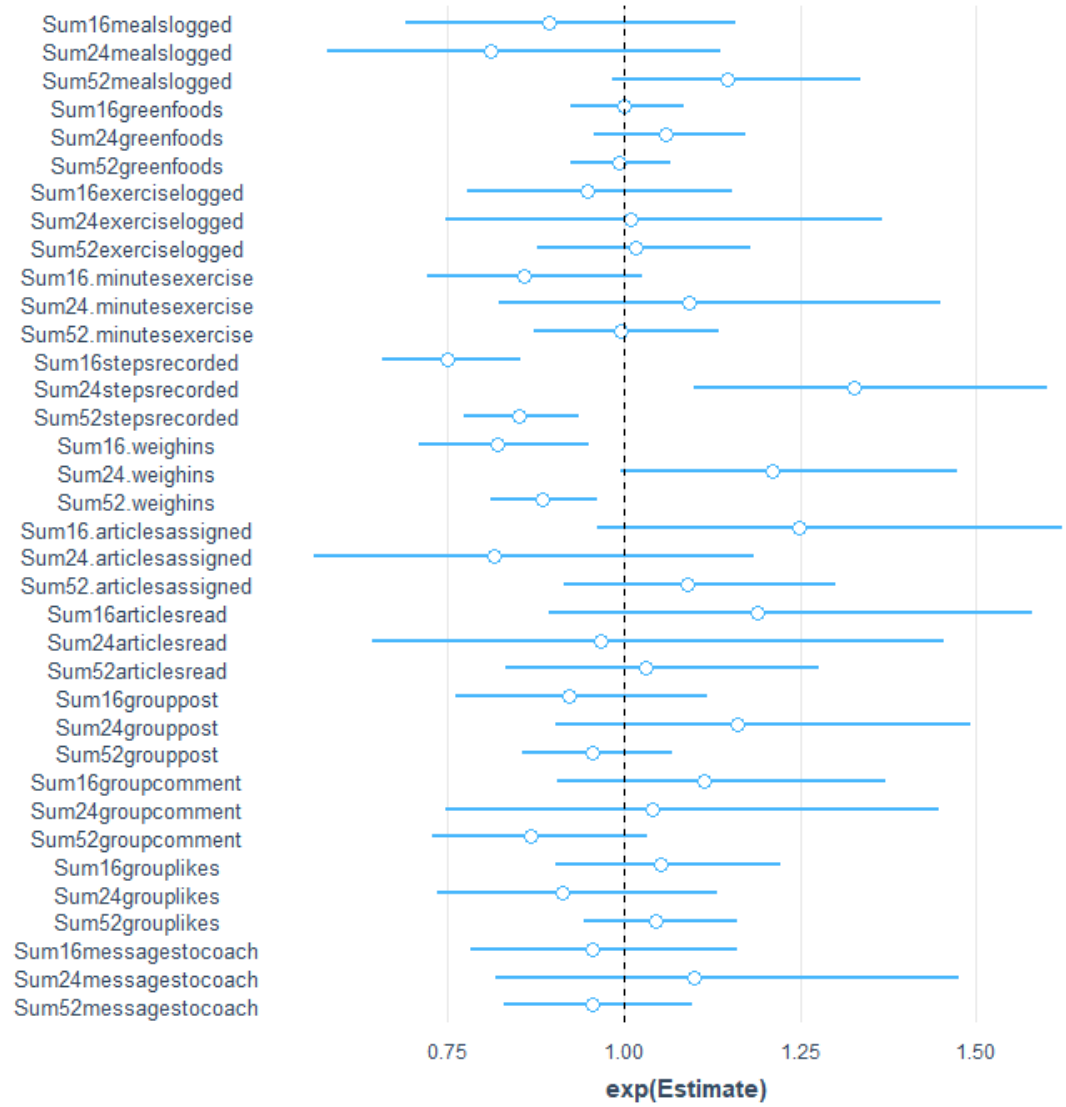
```
DF <- read.csv("C:/Users/LaoTz/Desktop/DF Articles/WeightLoss.csv", header =
TRUE)
DF <- na.omit(DF)
DF.t <- DF[-c(36,37,56)]
DF.t <- DF.t[c(10,4,7,15,16,17:53)]
DF.t <- DF.t[c(1,7:42)]
DF.t = scale(DF.t, center = TRUE, scale = TRUE)
DF.t <- as.data.frame(DF.t)
reg <- lm(Lowestweighinkg ~., DF.t)
```

MODEL INFO:
Observations: 7138
Dependent Variable: Lowestweighinkg
Type: OLS linear regression

MODEL FIT:
$F(36,7101) = 12.24$, $p = 0.00$
$R^2 = 0.06$
Adj. $R^2 = 0.05$

Standard errors: OLS

	Est.	2.5%	97.5%	t val.	p	partial.r	part.r
(Intercept)	0.00	-0.02	0.02	0.00	1.00		
Sum16mealslogged	-0.11	-0.36	0.14	-0.88	0.38	-0.01	-0.01
Sum24mealslogged	-0.21	-0.55	0.13	-1.21	0.23	-0.01	-0.01
Sum52mealslogged	0.14	-0.02	0.29	1.76	0.08	0.02	0.02
Sum16greenfoods	0.00	-0.07	0.07	0.03	0.98	0.00	0.00
Sum24greenfoods	0.06	-0.04	0.16	1.15	0.25	0.01	0.01
Sum52greenfoods	-0.01	-0.07	0.06	-0.21	0.83	-0.00	-0.00
Sum16exerciselogged	-0.05	-0.24	0.13	-0.57	0.57	-0.01	-0.01
Sum24exerciselogged	0.01	-0.26	0.28	0.08	0.94	0.00	0.00
Sum52exerciselogged	0.02	-0.11	0.15	0.27	0.79	0.00	0.00
Sum16.minutesexercise	-0.15	-0.30	0.00	-1.93	0.05	-0.02	-0.02
Sum24.minutesexercise	0.09	-0.13	0.31	0.79	0.43	0.01	0.01
Sum52.minutesexercise	-0.00	-0.12	0.11	-0.08	0.94	-0.00	-0.00
Sum16stepsrecorded	-0.29	-0.43	-0.15	-4.09	0.00	-0.05	-0.05
Sum24stepsrecorded	0.28	0.09	0.48	2.87	0.00	0.03	0.03
Sum52stepsrecorded	-0.16	-0.26	-0.07	-3.29	0.00	-0.04	-0.04
Sum16.weighins	-0.20	-0.34	-0.06	-2.76	0.01	-0.03	-0.03
Sum24.weighins	0.19	0.00	0.38	2.00	0.05	0.02	0.02
Sum52.weighins	-0.12	-0.21	-0.04	-2.96	0.00	-0.04	-0.03
Sum16.articlesassigned	0.22	-0.04	0.49	1.65	0.10	0.02	0.02
Sum24.articlesassigned	-0.20	-0.58	0.17	-1.06	0.29	-0.01	-0.01
Sum52.articlesassigned	0.09	-0.08	0.26	0.99	0.32	0.01	0.01
Sum16articlesread	0.17	-0.12	0.46	1.18	0.24	0.01	0.01
Sum24articlesread	-0.03	-0.44	0.37	-0.16	0.87	-0.00	-0.00
Sum52articlesread	0.03	-0.15	0.21	0.32	0.75	0.00	0.00
Sum16grouppost	-0.08	-0.27	0.11	-0.85	0.40	-0.01	-0.01
Sum24grouppost	0.15	-0.11	0.41	1.12	0.26	0.01	0.01
Sum52grouppost	-0.04	-0.16	0.07	-0.77	0.44	-0.01	-0.01
Sum16groupcomment	0.11	-0.12	0.34	0.94	0.35	0.01	0.01
Sum24groupcomment	0.04	-0.31	0.39	0.22	0.82	0.00	0.00
Sum52groupcomment	-0.14	-0.32	0.03	-1.62	0.11	-0.02	-0.02
Sum16grouplikes	0.05	-0.12	0.22	0.59	0.56	0.01	0.01
Sum24grouplikes	-0.09	-0.33	0.14	-0.77	0.44	-0.01	-0.01
Sum52grouplikes	0.04	-0.05	0.14	0.90	0.37	0.01	0.01
Sum16messagestocoach	-0.05	-0.25	0.16	-0.45	0.65	-0.01	-0.01
Sum24messagestocoach	0.09	-0.21	0.39	0.62	0.54	0.01	0.01
Sum52messagestocoach	-0.05	-0.18	0.09	-0.65	0.52	-0.01	-0.01

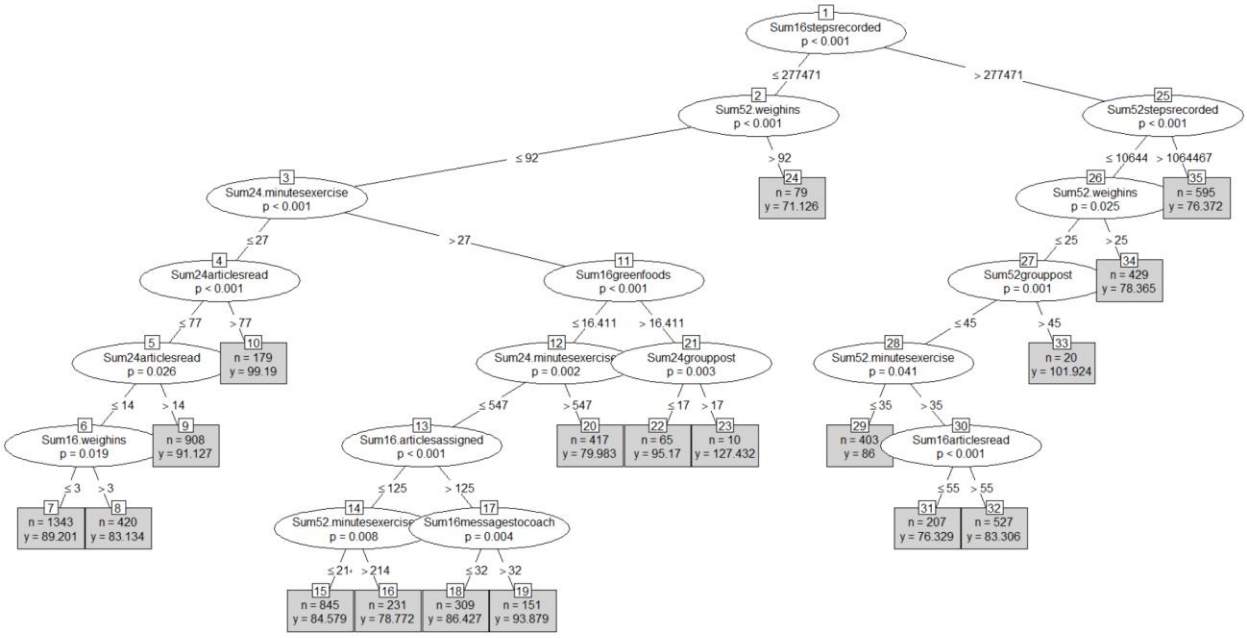


Regression Tree 1

```
DF <- read.csv("C:/Users/LaoTz/Desktop/DF Articles/WeightLoss.csv", header =
TRUE)
DF <- na.omit(DF)
DF.t <- DF[-c(36,37,56)]
DF.t <- DF.t[c(10,4,7,15,16,17:53)]
DF.t <- DF.t[c(1,7:42)]
model <- train(
  Lowestweighinkg ~., DF.t, method = "ctree",
  trControl = trainControl("cv", number = 10),
  tuneGrid = expand.grid(mincriterion = 0.95)
)
model$results
```

```
##   mincriterion     RMSE  Rsquared    MAE    RMSESD RsquaredSD     MAESD
## 1         0.95 20.18419 0.0405867 15.609 0.8007372 0.01521313 0.5138468
```

Tree Plot



User Engagement and Lowest Weigh-in based on 18 Terminal Nodes (Left to Right)

1	Lowest Weigh-in avg 89.20 kg = **WK 16 Steps Recorded ≤ 277471, WK 52 Weigh-ins ≤ 92, WK 24 Min Exercise ≤ 27, WK 24 Articles Read ≤ 14, WK 16 Weigh-ins ≤ 3**
2	Lowest Weigh-in avg 83.13 kg = **WK 16 Steps Recorded ≤ 277471, WK 52 Weigh-ins ≤ 92, WK 24 Min Exercise ≤ 27, WK 24 Articles Read ≤ 14, WK 16 Weigh-ins > 3**
3	Lowest Weigh-in avg 91.13 kg = **WK 16 Steps Recorded ≤ 277471, WK 52 Weigh-ins ≤ 92, WK 24 Min Exercise ≤ 27, WK 24 Articles Read > 14**
4	Lowest Weigh-in avg 99.19 kg = **WK 16 Steps Recorded ≤ 277471, WK 52 Weigh-ins ≤ 92, WK 24 Min Exercise > 27, WK 24 Articles Read > 77**
5	Lowest Weigh-in avg 84.58 kg = **WK 16 Steps Recorded ≤ 277471, WK 52 Weigh-ins ≤ 92, WK 24 Min Exercise > 27, WK 16 Green Foods ≤ 16.41, WK 24 Min Exercise ≤ 547, WK 16 Articles Assigned ≤ 125, WK 52 Min Exercise ≤ 214**
6	Lowest Weigh-in avg 78.77 kg = **WK 16 Steps Recorded ≤ 277471, WK 52 Weigh-ins ≤ 92, WK 24 Min Exercise > 27, WK 16 Green Foods ≤ 16.41, WK 24 Min Exercise ≤ 547, WK 16 Articles Assigned ≤ 125, WK 52 Min Exercise > 214**
7	Lowest Weigh-in avg 86.43 kg = **WK 16 Steps Recorded ≤ 277471, WK 52 Weigh-ins ≤ 92, WK 24 Min Exercise > 27, WK 16 Green Foods ≤ 16.41, WK 24 Min Exercise ≤ 547, WK 16 Articles Assigned > 125, WK 16 Messages to Coach ≤ 32**
8	Lowest Weigh-in avg 93.88 kg = **WK 16 Steps Recorded ≤ 277471, WK 52 Weigh-ins ≤ 92, WK 24 Min Exercise > 27, WK 16 Green Foods ≤ 16.41, WK 24 Min Exercise ≤ 547, WK 16 Articles Assigned > 125, WK 16 Messages to Coach > 32**

9	Lowest Weigh-in avg 79.98 kg = **WK 16 Steps Recorded ≤ 277471, WK 52 Weigh-ins ≤ 92, WK 24 Min Exercise > 27, WK 16 Green Foods ≤ 16.41, WK 24 Min Exercise > 547**
10	Lowest Weigh-in avg 95.17 kg = **WK 16 Steps Recorded ≤ 277471, WK 52 Weigh-ins ≤ 92, WK 24 Min Exercise > 27, WK 16 Green Foods ≤ 16.41, WK 24 Group Posts ≤ 17**
11 High	Lowest Weigh-in avg 127.43 kg = **WK 16 Steps Recorded ≤ 277471, WK 52 Weigh-ins ≤ 92, WK 24 Min Exercise > 27, WK 16 Green Foods ≤ 16.41, WK 24 Group Posts > 17**
12 Low	Lowest Weigh-in avg 71.13 kg = **WK 16 Steps Recorded ≤ 277471, WK 52 Weigh-ins > 92**
13	Lowest Weigh-in avg 86 kg = **WK 16 Steps Recorded ≤ 277471, WK 52 Steps Recorded ≤ 10644, WK 52 Weigh-ins ≤ 25, WK 52 Group Posts ≤ 45, WK 52 Min of Exercise ≤ 35**
14	Lowest Weigh-in avg 76.33 kg = **WK 16 Steps Recorded ≤ 277471, WK 52 Steps Recorded ≤ 10644, WK 52 Weigh-ins ≤ 25, WK 52 Group Posts ≤ 45, WK 52 Min of Exercise > 35, WK 16 Articles Read ≤ 55**
15	Lowest Weigh-in avg 83.31 kg = **WK 16 Steps Recorded ≤ 277471, WK 52 Steps Recorded ≤ 10644, WK 52 Weigh-ins ≤ 25, WK 52 Group Posts ≤ 45, WK 52 Min of Exercise > 35, WK 16 Articles Read > 55**
16 2nd Highest	Lowest Weigh-in avg 101.92 kg = **WK 16 Steps Recorded ≤ 277471, WK 52 Steps Recorded ≤ 10644, WK 52 Weigh-ins ≤ 25, WK 52 Group Posts > 45**
17	Lowest Weigh-in avg 78.37 kg = **WK 16 Steps Recorded ≤ 277471, WK 52 Steps Recorded ≤ 10644, WK 52 Weigh-ins > 25**
18	Lowest Weigh-in avg 76.37 kg = **WK 16 Steps Recorded ≤ 277471, WK 52 Steps Recorded ≥ 10644**

Random Forest 1

```
DF <- read.csv("C:/Users/LaoTz/Desktop/DF Articles/WeightLoss.csv", header =
TRUE)
DF <- na.omit(DF)
DF.t <- DF[-c(36,37,56)]
DF.t <- DF.t[c(10,4,7,15,16,17:53)]
DF.t <- DF.t[c(1,7:42)]
rf <- randomForest(Lowestweighinkg ~ ., data = DF.t, ntree = 25,
                   mtry = 4, nodesize = 5, importance = TRUE)
```

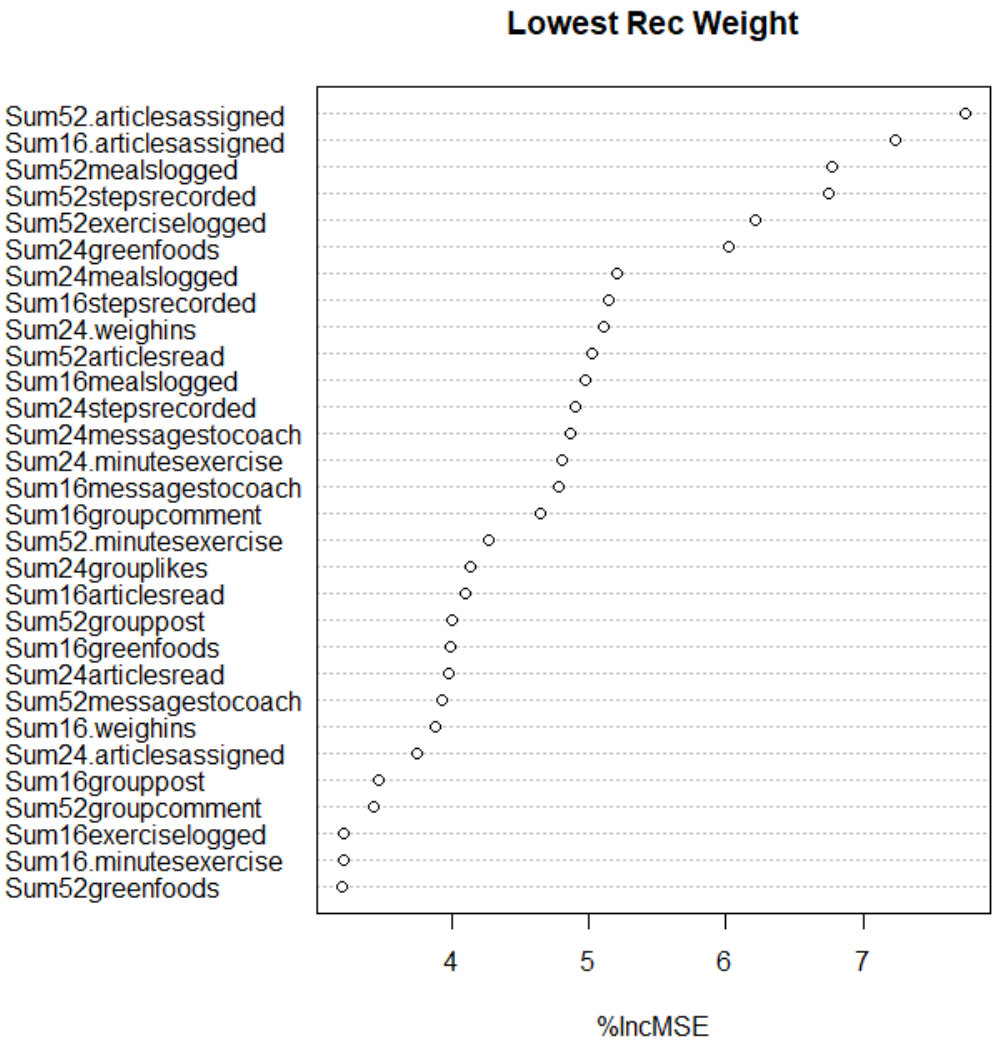
Signicance Testing

```
rf.perm <- rf.significance(rf, DF.t, q = 0.99, p = 0.05, nperm=99, ntree=25)
rf.perm

## Number of permutations:  99
## p-value:  0.01
## Model signifiant at p = 0.01
##   Model R-square:  -0.1295139
##   Random R-square:  -0.2789146
##   Random R-square variance:  0.0001719067
```

Variable Importance Plot

```
varImpPlot(rf, type = 1, main = "Lowest Rec Weight")
```



Multiple Regression 2

Difference Between First Weigh-in and Lowest Weigh-in

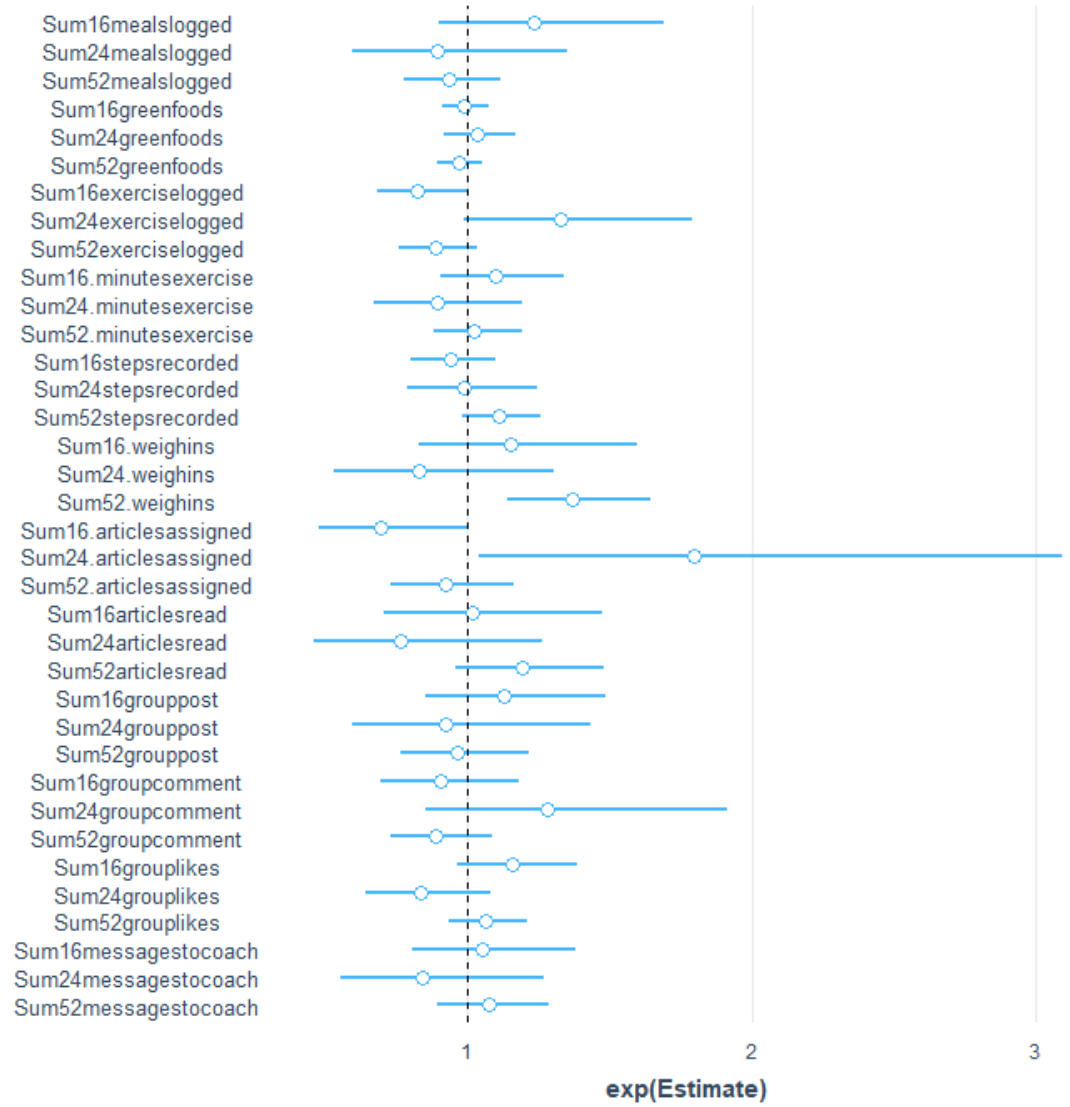
```
DF <- read.csv("C:/Users/LaoTz/Desktop/DF Articles/WeightLoss.csv", header =
TRUE)
DF <- na.omit(DF)
DF.t <- DF[-c(36,37,56)]
DF.t <- DF.t[c(11,4,7,15,16,17:53)]
DF.t <- DF.t[c(1,7:42)]
DF.t = scale(DF.t, center = TRUE, scale = TRUE)
DF.t <- as.data.frame(DF.t)
reg <- lm(AbsDiffFirstWeighinkg ~., DF.t)
```

MODEL INFO:
Observations: 7138
Dependent Variable: AbsDiffFirstWeighinkg
Type: OLS linear regression

MODEL FIT:
$F(36,7101) = 25.77$, $p = 0.00$
$R^2 = 0.12$
Adj. $R^2 = 0.11$

Standard errors: OLS

	Est.	2.5%	97.5%	t val.	p	partial.r	part.r
(Intercept)	-0.00	-0.02	0.02	-0.00	1.00		
Sum16mealslogged	0.21	-0.03	0.45	1.69	0.09	0.02	0.02
Sum24mealslogged	-0.11	-0.44	0.22	-0.66	0.51	-0.01	-0.01
Sum52mealslogged	-0.07	-0.22	0.08	-0.94	0.35	-0.01	-0.01
Sum16greenfoods	-0.01	-0.08	0.06	-0.34	0.73	-0.00	-0.00
Sum24greenfoods	0.03	-0.06	0.13	0.69	0.49	0.01	0.01
Sum52greenfoods	-0.03	-0.09	0.03	-1.07	0.29	-0.01	-0.01
Sum16exerciselogged	-0.19	-0.37	-0.02	-2.15	0.03	-0.03	-0.02
Sum24exerciselogged	0.28	0.02	0.54	2.14	0.03	0.03	0.02
Sum52exerciselogged	-0.12	-0.25	0.00	-1.95	0.05	-0.02	-0.02
Sum16.minutesexercise	0.09	-0.05	0.24	1.25	0.21	0.01	0.01
Sum24.minutesexercise	-0.12	-0.33	0.10	-1.07	0.28	-0.01	-0.01
Sum52.minutesexercise	0.02	-0.09	0.13	0.39	0.70	0.00	0.00
Sum16stepsrecorded	-0.06	-0.20	0.07	-0.94	0.35	-0.01	-0.01
Sum24stepsrecorded	-0.01	-0.20	0.18	-0.12	0.91	-0.00	-0.00
Sum52stepsrecorded	0.11	0.01	0.20	2.21	0.03	0.03	0.02
Sum16.weighins	0.14	0.00	0.28	2.02	0.04	0.02	0.02
Sum24.weighins	-0.19	-0.37	-0.01	-2.03	0.04	-0.02	-0.02
Sum52.weighins	0.31	0.23	0.39	7.71	0.00	0.09	0.09
Sum16.articlesassigned	-0.37	-0.62	-0.11	-2.81	0.01	-0.03	-0.03
Sum24.articlesassigned	0.58	0.22	0.95	3.13	0.00	0.04	0.03
Sum52.articlesassigned	-0.08	-0.25	0.08	-0.97	0.33	-0.01	-0.01
Sum16articlesread	0.02	-0.26	0.30	0.12	0.91	0.00	0.00
Sum24articlesread	-0.27	-0.67	0.12	-1.36	0.18	-0.02	-0.02
Sum52articlesread	0.18	-0.00	0.35	1.93	0.05	0.02	0.02
Sum16grouppost	0.12	-0.06	0.30	1.28	0.20	0.02	0.01
Sum24grouppost	-0.08	-0.33	0.17	-0.62	0.53	-0.01	-0.01
Sum52grouppost	-0.04	-0.15	0.07	-0.71	0.48	-0.01	-0.01
Sum16groupcomment	-0.10	-0.32	0.12	-0.90	0.37	-0.01	-0.01
Sum24groupcomment	0.25	-0.10	0.59	1.41	0.16	0.02	0.02
Sum52groupcomment	-0.12	-0.29	0.05	-1.38	0.17	-0.02	-0.02
Sum16grouplikes	0.15	-0.02	0.31	1.75	0.08	0.02	0.02
Sum24grouplikes	-0.18	-0.41	0.04	-1.58	0.11	-0.02	-0.02
Sum52grouplikes	0.06	-0.03	0.16	1.28	0.20	0.02	0.01
Sum16messagestocoach	0.05	-0.15	0.25	0.50	0.61	0.01	0.01
Sum24messagestocoach	-0.18	-0.47	0.11	-1.19	0.24	-0.01	-0.01
Sum52messagestocoach	0.07	-0.06	0.20	1.05	0.29	0.01	0.01



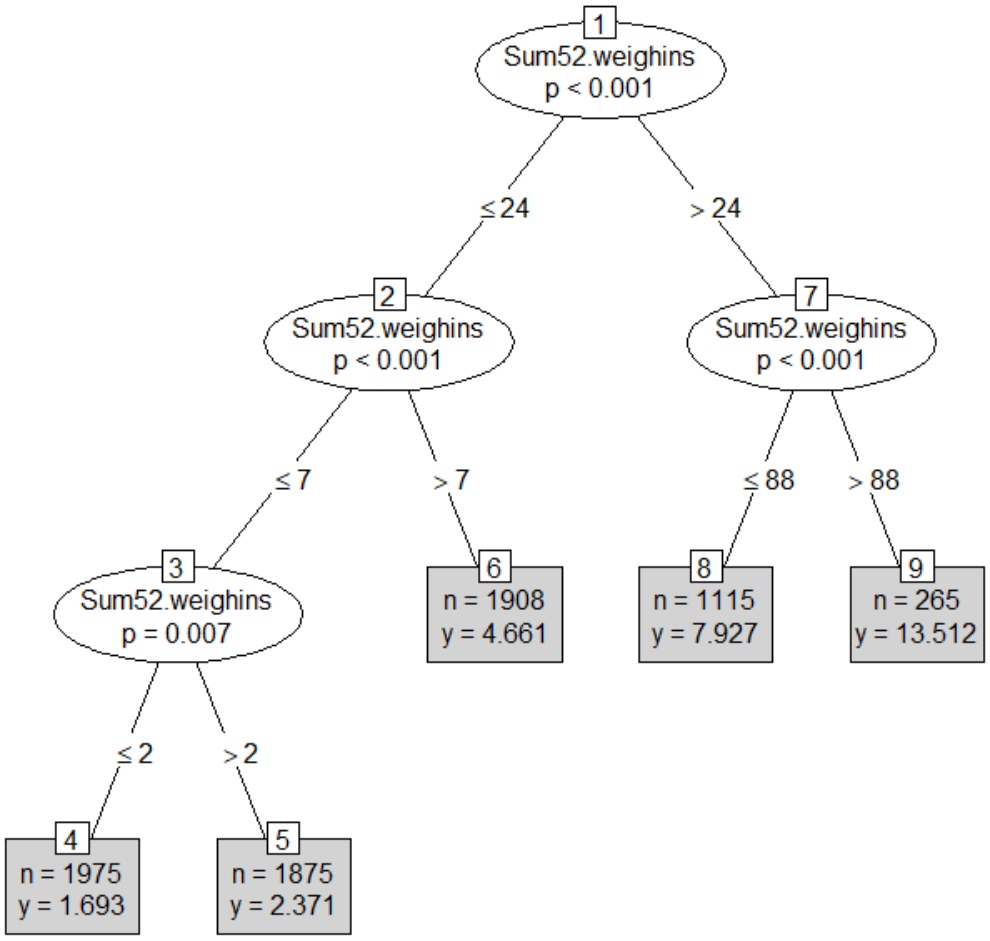
Regression Tree 2

```
DF <- read.csv("C:/Users/LaoTz/Desktop/DF Articles/WeightLoss.csv", header =
TRUE)
DF <- na.omit(DF)
DF.t <- DF[-c(36,37,56)]
DF.t <- DF.t[c(11,4,7,15,16,17:53)]
DF.t <- DF.t[c(1,7:42)]
model <- train(
  AbsDiffFirstWeighinkg ~., DF.t, method = "ctree",
  trControl = trainControl("cv", number = 10),
  tuneGrid = expand.grid(mincriterion = 0.95)
)
model$results
```

```
##   mincriterion      RMSE  Rsquared      MAE   RMSESD RsquaredSD     MAESD
## 1         0.95 7.615452 0.1191228 3.790677 1.028185 0.03733651 0.2453116
```

Tree Plot

```
plot(model$finalModel, type = "simple")
```



User Engagement and Difference Between First Weigh-in and Lowest Weigh-in based on 5 Terminal Nodes (Left to Right)

1	Diff 1st Weight Lost avg 1.63 kg = **WK 52 Weigh-ins ≤ 2**
2	Diff 1st Weight Lost avg 2.37 kg = **WK 52 Weigh-ins > 2 & ≤ 7**
3	Diff 1st Weight Lost avg 4.66 kg = **WK 52 Weigh-ins > 7 & ≤ 24**
4	Diff 1st Weight Lost avg 7.93 kg = **WK 52 Weigh-ins > 24 & ≤ 88**
5	Diff 1st Weight Lost avg 13.21 kg = **WK 52 Weigh-ins > 24 & > 88**

Random Forest 2

```
DF <- read.csv("C:/Users/LaoTz/Desktop/DF Articles/WeightLoss.csv", header =
TRUE)
DF <- na.omit(DF)
DF.t <- DF[-c(36,37,56)]
DF.t <- DF.t[c(11,4,7,15,16,17:53)]
DF.t <- DF.t[c(1,7:42)]
rf <- randomForest(AbsDiffFirstWeighinkg ~ ., data = DF.t, ntree = 25,
                   mtry = 4, nodesize = 5, importance = TRUE)
```

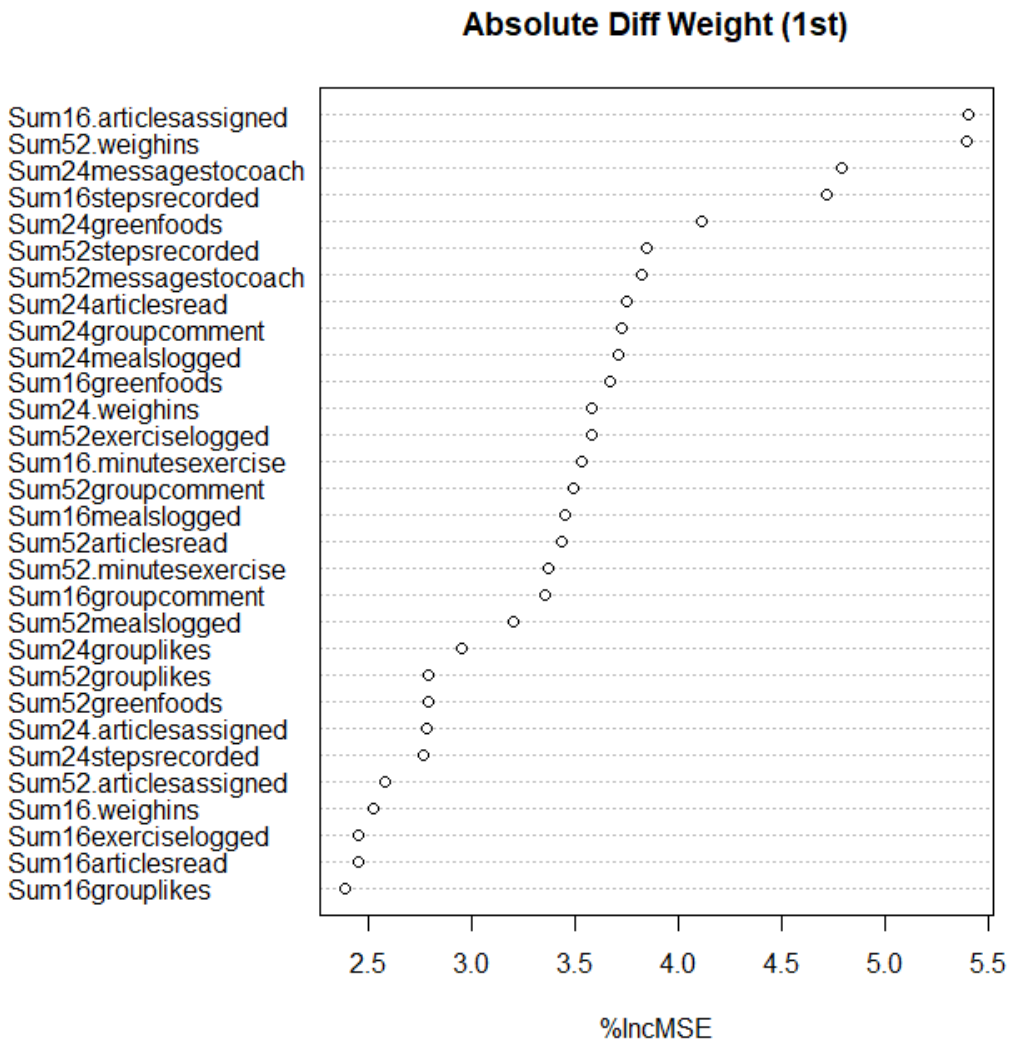
Signicance Testing

```
rf.perm <- rf.significance(rf, DF.t, q = 0.99, p = 0.05, nperm=99, ntree=25)
rf.perm

## Number of permutations:  99
## p-value:  0.01
## Model signifiant at p = 0.01
##   Model R-square:  -0.07512337
##   Random R-square:  -0.3191467
##   Random R-square variance:  0.0006592031
```

Variable Importance Plot

```
varImpPlot(rf, type = 1, main = "Absolute Diff Weight (1st)")
```



Multiple Regression 3

Differnece Between Initial Weigh-in and Lowest Weigh-in

```
DF <- read.csv("C:/Users/LaoTz/Desktop/DF Articles/WeightLoss.csv", header =
TRUE)
DF <- na.omit(DF)
DF.t <- DF[-c(36,37,56)]
DF.t <- DF.t[c(12,4,7,15,16,17:53)]
DF.t <- DF.t[c(1,7:42)]
DF.t = scale(DF.t, center = TRUE, scale = TRUE)
DF.t <- as.data.frame(DF.t)
```

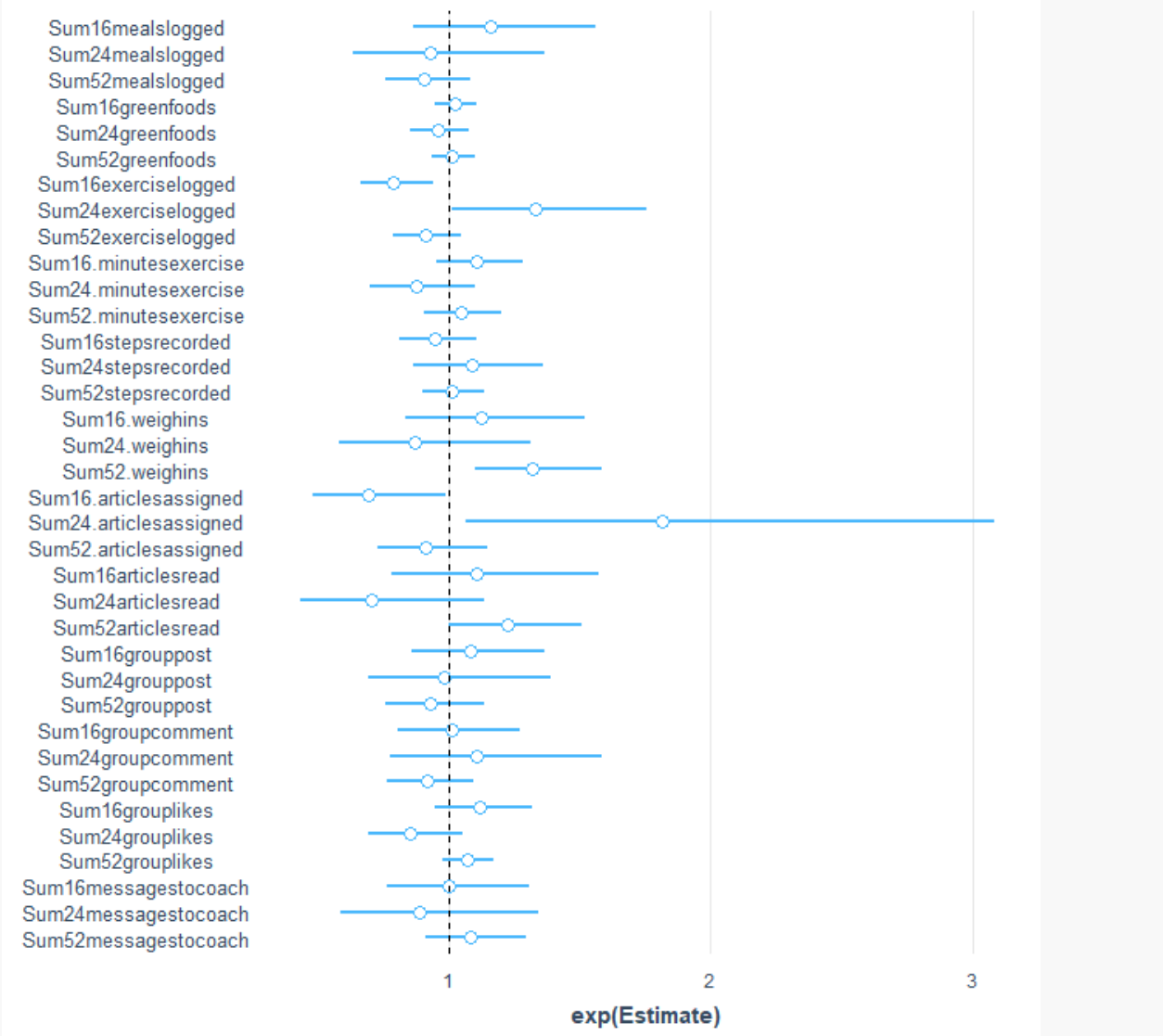
```
reg <- lm(AbsDiffInitWeighinkg ~., DF.t)
```

MODEL INFO:
Observations: 7138
Dependent variable: AbsDiffFirstWeighinkg
Type: OLS linear regression

MODEL FIT:
$F(36,7101) = 25.77$, $p = 0.00$
$R^2 = 0.12$
Adj. $R^2 = 0.11$

Standard errors: OLS

	Est.	2.5%	97.5%	t val.	p	partial.r	part.r
(Intercept)	-0.00	-0.02	0.02	-0.00	1.00		
Sum16mealslogged	0.21	-0.03	0.45	1.69	0.09	0.02	0.02
Sum24mealslogged	-0.11	-0.44	0.22	-0.66	0.51	-0.01	-0.01
Sum52mealslogged	-0.07	-0.22	0.08	-0.94	0.35	-0.01	-0.01
Sum16greenfoods	-0.01	-0.08	0.06	-0.34	0.73	-0.00	-0.00
Sum24greenfoods	0.03	-0.06	0.13	0.69	0.49	0.01	0.01
Sum52greenfoods	-0.03	-0.09	0.03	-1.07	0.29	-0.01	-0.01
Sum16exerciselogged	-0.19	-0.37	-0.02	-2.15	0.03	-0.03	-0.02
Sum24exerciselogged	0.28	0.02	0.54	2.14	0.03	0.03	0.02
Sum52exerciselogged	-0.12	-0.25	0.00	-1.95	0.05	-0.02	-0.02
Sum16.minutesexercise	0.09	-0.05	0.24	1.25	0.21	0.01	0.01
Sum24.minutesexercise	-0.12	-0.33	0.10	-1.07	0.28	-0.01	-0.01
Sum52.minutesexercise	0.02	-0.09	0.13	0.39	0.70	0.00	0.00
Sum16stepsrecorded	-0.06	-0.20	0.07	-0.94	0.35	-0.01	-0.01
Sum24stepsrecorded	-0.01	-0.20	0.18	-0.12	0.91	-0.00	-0.00
Sum52stepsrecorded	0.11	0.01	0.20	2.21	0.03	0.03	0.02
Sum16.weighins	0.14	0.00	0.28	2.02	0.04	0.02	0.02
Sum24.weighins	-0.19	-0.37	-0.01	-2.03	0.04	-0.02	-0.02
Sum52.weighins	0.31	0.23	0.39	7.71	0.00	0.09	0.09
Sum16.articlesassigned	-0.37	-0.62	-0.11	-2.81	0.01	-0.03	-0.03
Sum24.articlesassigned	0.58	0.22	0.95	3.13	0.00	0.04	0.03
Sum52.articlesassigned	-0.08	-0.25	0.08	-0.97	0.33	-0.01	-0.01
Sum16articlesread	0.02	-0.26	0.30	0.12	0.91	0.00	0.00
Sum24articlesread	-0.27	-0.67	0.12	-1.36	0.18	-0.02	-0.02
Sum52articlesread	0.18	-0.00	0.35	1.93	0.05	0.02	0.02
Sum16grouppost	0.12	-0.06	0.30	1.28	0.20	0.02	0.01
Sum24grouppost	-0.08	-0.33	0.17	-0.62	0.53	-0.01	-0.01
Sum52grouppost	-0.04	-0.15	0.07	-0.71	0.48	-0.01	-0.01
Sum16groupcomment	-0.10	-0.32	0.12	-0.90	0.37	-0.01	-0.01
Sum24groupcomment	0.25	-0.10	0.59	1.41	0.16	0.02	0.02
Sum52groupcomment	-0.12	-0.29	0.05	-1.38	0.17	-0.02	-0.02
Sum16grouplikes	0.15	-0.02	0.31	1.75	0.08	0.02	0.02
Sum24grouplikes	-0.18	-0.41	0.04	-1.58	0.11	-0.02	-0.02
Sum52grouplikes	0.06	-0.03	0.16	1.28	0.20	0.02	0.01
Sum16messagestocoach	0.05	-0.15	0.25	0.50	0.61	0.01	0.01
Sum24messagestocoach	-0.18	-0.47	0.11	-1.19	0.24	-0.01	-0.01
Sum52messagestocoach	0.07	-0.06	0.20	1.05	0.29	0.01	0.01



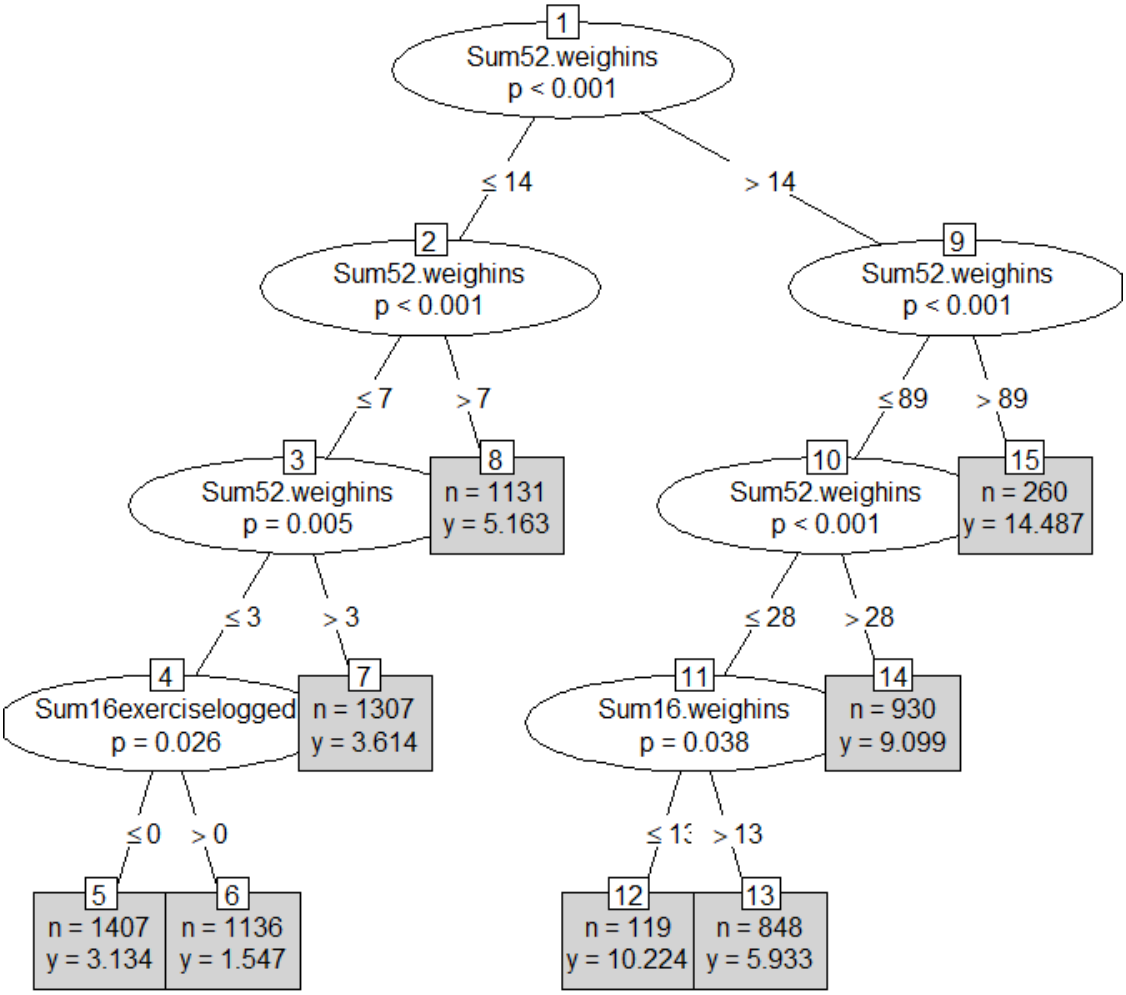
Regression Tree 3

```
DF <- read.csv("C:/Users/LaoTz/Desktop/DF Articles/WeightLoss.csv", header =
TRUE)
DF <- na.omit(DF)
DF.t <- DF[-c(36,37,56)]
DF.t <- DF.t[c(12,4,7,15,16,17:53)]
DF.t <- DF.t[c(1,7:42)]
model <- train(
  AbsDiffInitWeighinkg ~., DF.t, method = "ctree",
  trControl = trainControl("cv", number = 10),
  tuneGrid = expand.grid(mincriterion = 0.95)
)
model$results
```

```
##   mincriterion      RMSE  Rsquared      MAE   RMSESD RsquaredSD      MAESD
## 1         0.95 8.301961 0.1043869 4.27894 1.078303 0.02870102 0.3197231
```

Tree Model

```
plot(model$finalModel, type = "simple")
```



User Engagement and Difference Between Initial Weigh-in and Lowest Weigh-in based on 8 Terminal Nodes (Left to Right)

1	Diff Initial Weight Lost avg 3.13 kg = **WK 52 Weigh-ins ≤ 3, WK 16 Exercise Logged ≤ 0**
2 Low	Diff Initial Weight Lost avg 1.55 kg = **WK 52 Weigh-ins < 3, WK 16 Exercise Logged > 0 & ≤ 3**
3	Diff Initial Weight Lost avg 3.61 kg = **WK 52 Weigh-ins >3 & ≤ 7**
4	Diff Initial Weight Lost avg 5.16 kg = **WK 52 Weigh-ins ≤ 14 & > 7**
5	Diff Initial Weight Lost avg 10.22 kg = **WK 52 Weigh-ins > 14, WK 16 Weigh-ins ≤ 13**

6	Diff Initial Weight Lost avg 5.93 kg = **WK 52 Weigh-ins > 14, WK 52 Weigh-ins ≤ 28, WK 16 Weigh-ins > 13**
7	Diff Initial Weight Lost avg 9.10 kg = **WK 52 Weigh-ins > 14, WK 52 Weigh-ins ≤ 89, WK 52 Weigh-ins > 28**
8 High	Diff Initial Weight Lost avg 14.49 kg = **WK 52 Weigh-ins > 14, WK 52 Weigh-ins > 89**

Random Forest 3

```
DF <- read.csv("C:/Users/LaoTz/Desktop/DF Articles/WeightLoss.csv", header =
TRUE)
DF <- na.omit(DF)
DF.t <- DF[-c(36,37,56)]
DF.t <- DF.t[c(12,4,7,15,16,17:53)]
DF.t <- DF.t[c(1,7:42)]
rf <- randomForest(AbsDiffInitWeighinkg ~ ., data = DF.t, ntree = 25,
                   mtry = 4, nodesize = 5, importance = TRUE)
```

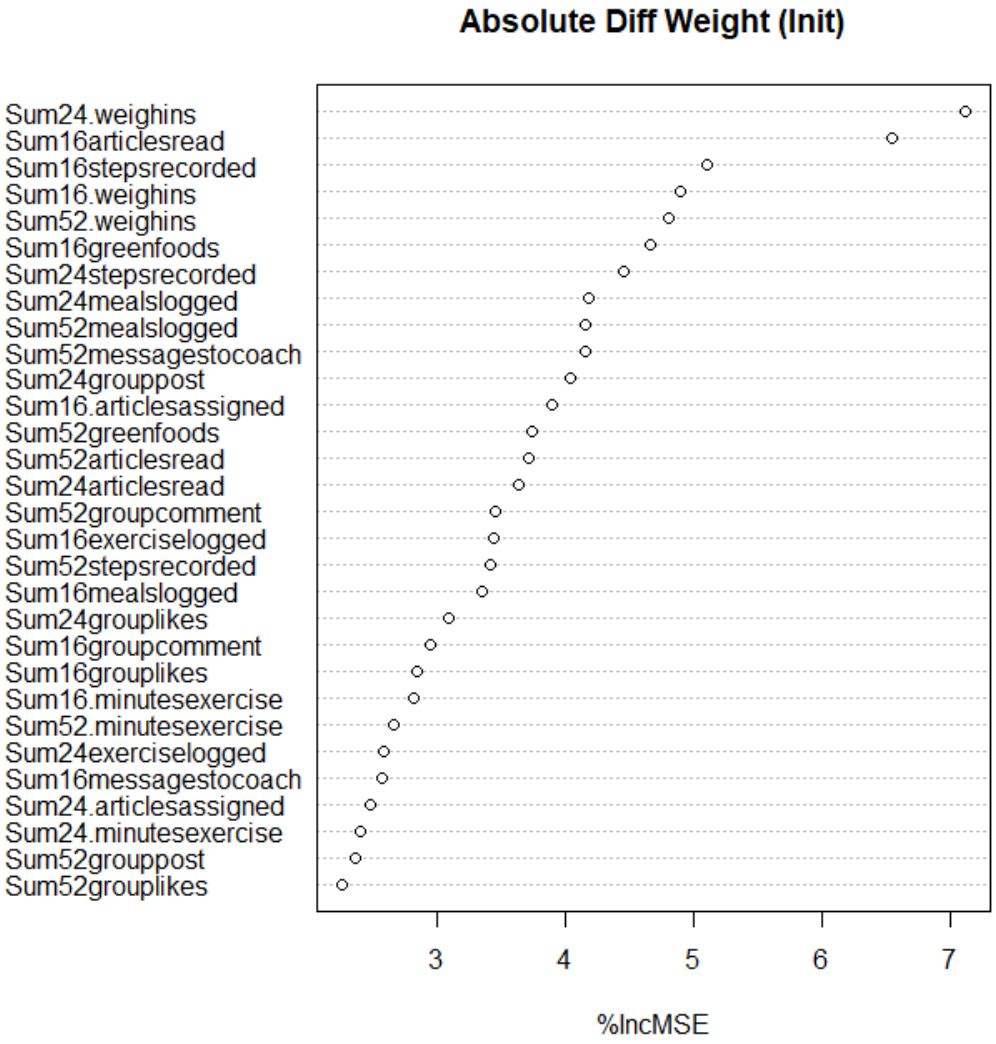
Signicance Testing

```
rf.perm <- rf.significance(rf, DF.t, q = 0.99, p = 0.05, nperm=99, ntree=25)
rf.perm

## Number of permutations:  99
## p-value:  0.01
## Model signifiant at p = 0.01
##   Model R-square:  -0.1279674
##   Random R-square:  -0.3108948
##   Random R-square variance:  0.0005847191
```

Variable Importance Plot

```
varImpPlot(rf, type = 1, main = "Absolute Diff Weight (Init)")
```



Multiple Regression 4

Curriculum Week (or Length of Time with DF?)

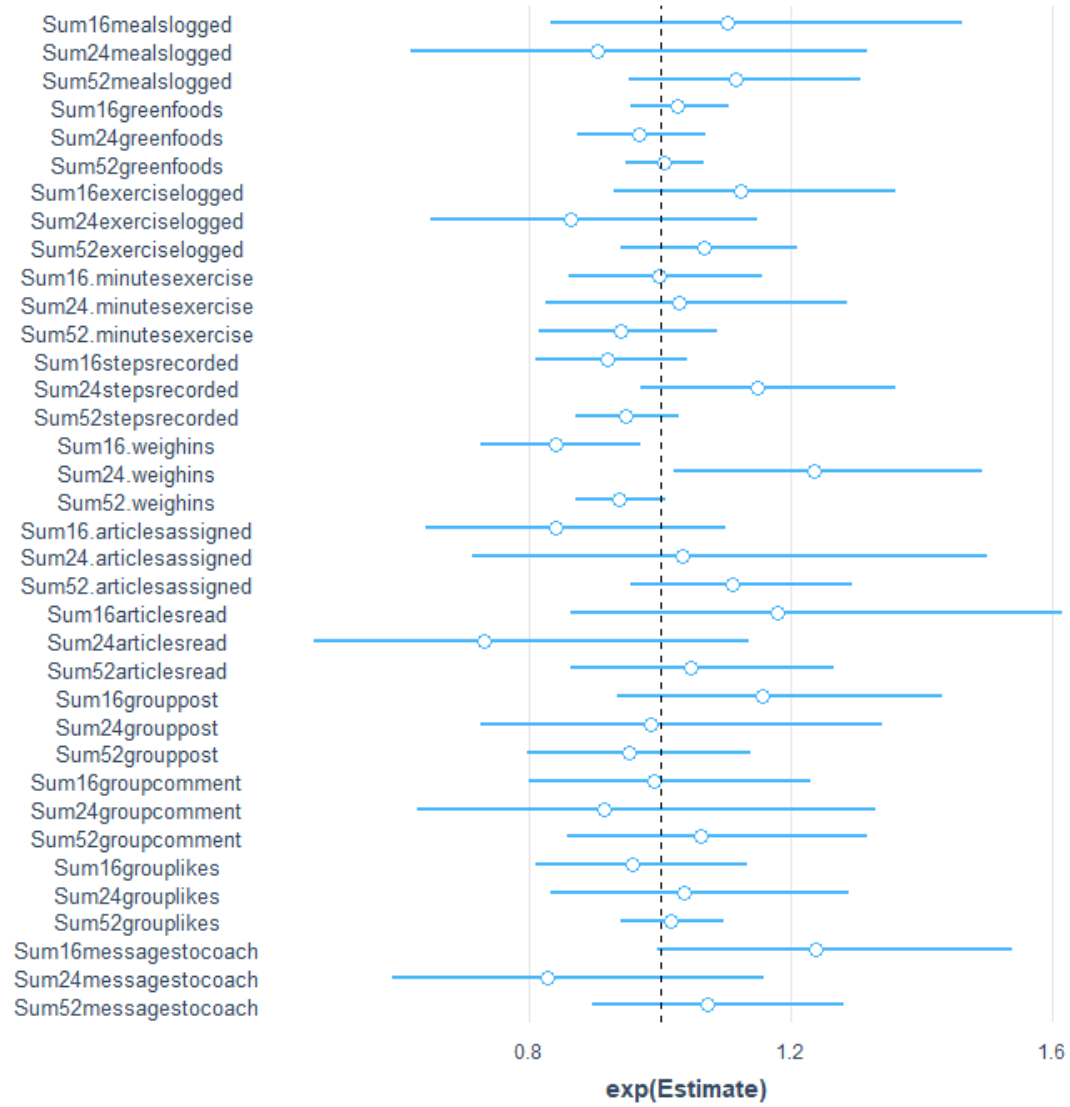
```
DF <- read.csv("C:/Users/LaoTz/Desktop/DF Articles/WeightLoss.csv", header =
TRUE)
DF <- na.omit(DF)
DF.t <- DF[-c(36,37,56)]
DF.t <- DF.t[c(4,7,15,16,17:53)]
DF.t <- DF.t[c(5,6:41)]
DF.t = scale(DF.t, center = TRUE, scale = TRUE)
DF.t <- as.data.frame(DF.t)
reg <- lm(CurriculumWeek ~., DF.t)
```

MODEL INFO:
Observations: 7138
Dependent Variable: CurriculumWeek
Type: OLS linear regression

MODEL FIT:
$F(36,7101) = 3.68$, $p = 0.00$
$R^2 = 0.02$
Adj. $R^2 = 0.01$

Standard errors: OLS

	Est.	2.5%	97.5%	t val.	p	partial.r	part.r
(Intercept)	-0.00	-0.02	0.02	-0.00	1.00		
Sum16mealslogged	0.10	-0.16	0.35	0.76	0.45	0.01	0.01
Sum24mealslogged	-0.10	-0.45	0.24	-0.58	0.56	-0.01	-0.01
Sum52mealslogged	0.11	-0.05	0.26	1.38	0.17	0.02	0.02
Sum16greenfoods	0.03	-0.05	0.10	0.68	0.50	0.01	0.01
Sum24greenfoods	-0.03	-0.14	0.07	-0.65	0.51	-0.01	-0.01
Sum52greenfoods	0.01	-0.06	0.07	0.18	0.85	0.00	0.00
Sum16exerciselogged	0.12	-0.07	0.30	1.22	0.22	0.01	0.01
Sum24exerciselogged	-0.15	-0.42	0.13	-1.06	0.29	-0.01	-0.01
Sum52exerciselogged	0.06	-0.07	0.19	0.96	0.34	0.01	0.01
Sum16.minutesexercise	-0.00	-0.16	0.15	-0.03	0.98	-0.00	-0.00
Sum24.minutesexercise	0.03	-0.19	0.25	0.26	0.80	0.00	0.00
Sum52.minutesexercise	-0.06	-0.18	0.05	-1.04	0.30	-0.01	-0.01
Sum16stepsrecorded	-0.09	-0.23	0.06	-1.20	0.23	-0.01	-0.01
Sum24stepsrecorded	0.14	-0.06	0.34	1.38	0.17	0.02	0.02
Sum52stepsrecorded	-0.05	-0.15	0.04	-1.09	0.28	-0.01	-0.01
Sum16.weighins	-0.18	-0.32	-0.03	-2.39	0.02	-0.03	-0.03
Sum24.weighins	0.21	0.02	0.40	2.16	0.03	0.03	0.03
Sum52.weighins	-0.07	-0.15	0.02	-1.53	0.13	-0.02	-0.02
Sum16.articlesassigned	-0.17	-0.44	0.09	-1.27	0.20	-0.02	-0.01
Sum24.articlesassigned	0.03	-0.35	0.42	0.17	0.86	0.00	0.00
Sum52.articlesassigned	0.11	-0.07	0.28	1.18	0.24	0.01	0.01
Sum16articlesread	0.17	-0.13	0.46	1.10	0.27	0.01	0.01
Sum24articlesread	-0.31	-0.73	0.10	-1.48	0.14	-0.02	-0.02
Sum52articlesread	0.04	-0.14	0.23	0.47	0.64	0.01	0.01
Sum16grouppost	0.14	-0.05	0.34	1.49	0.14	0.02	0.02
Sum24grouppost	-0.01	-0.28	0.25	-0.10	0.92	-0.00	-0.00
Sum52grouppost	-0.05	-0.17	0.07	-0.82	0.41	-0.01	-0.01
Sum16groupcomment	-0.01	-0.24	0.22	-0.07	0.94	-0.00	-0.00
Sum24groupcomment	-0.09	-0.45	0.27	-0.50	0.62	-0.01	-0.01
Sum52groupcomment	0.06	-0.12	0.24	0.68	0.50	0.01	0.01
Sum16grouplikes	-0.04	-0.21	0.13	-0.49	0.63	-0.01	-0.01
Sum24grouplikes	0.03	-0.20	0.27	0.28	0.78	0.00	0.00
Sum52grouplikes	0.02	-0.08	0.12	0.31	0.76	0.00	0.00
Sum16messagestocoach	0.21	0.00	0.42	2.01	0.04	0.02	0.02
Sum24messagestocoach	-0.19	-0.50	0.12	-1.22	0.22	-0.01	-0.01
Sum52messagestocoach	0.07	-0.07	0.21	0.97	0.33	0.01	0.01



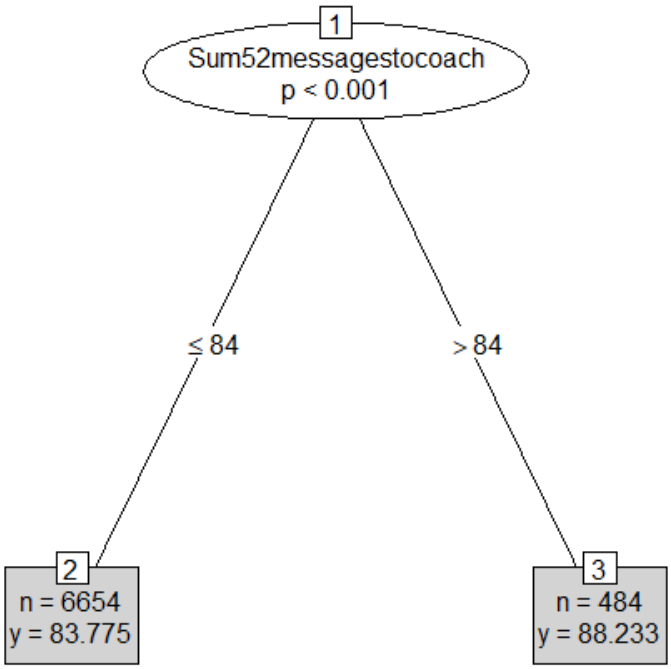
Regression Tree 4

```
DF <- read.csv("C:/Users/LaoTz/Desktop/DF Articles/WeightLoss.csv", header =
TRUE)
DF <- na.omit(DF)
DF.t <- DF[-c(36,37,56)]
DF.t <- DF.t[c(4,7,15,16,17:53)]
DF.t <- DF.t[c(5,6:41)]
model <- train(
  CurriculumWeek ~., DF.t, method = "ctree",
  trControl = trainControl("cv", number = 10),
  tuneGrid = expand.grid(mincriterion = 0.95)
)
model$results
```

```
##   mincriterion      RMSE   Rsquared      MAE    RMSESD RsquaredSD      MAESD
## 1         0.95 14.60428 0.02129565 8.399708 0.9878189  0.0297253 0.3644427
```

Tree Model

```
plot(model$finalModel, type = "simple")
```



User Engagement and Curriculum Week based on 2 Terminal Nodes (Left to Right)

1	Curriculum Week avg 83.78 = **WK 52 Messages to Coach ≤ 82**
2	Curriculum Week avg 88.23 = **WK 52 Messages to Coach > 82**

Random Forest 4

```
DF <- read.csv("C:/Users/LaoTz/Desktop/DF Articles/WeightLoss.csv", header =
TRUE)
DF <- na.omit(DF)
DF.t <- DF[-c(36,37,56)]
DF.t <- DF.t[c(4,7,15,16,17:53)]
DF.t <- DF.t[c(5,6:41)]
rf <- randomForest(CurriculumWeek ~ ., data = DF.t, ntree = 25,
                   mtry = 4, nodesize = 5, importance = TRUE)
```

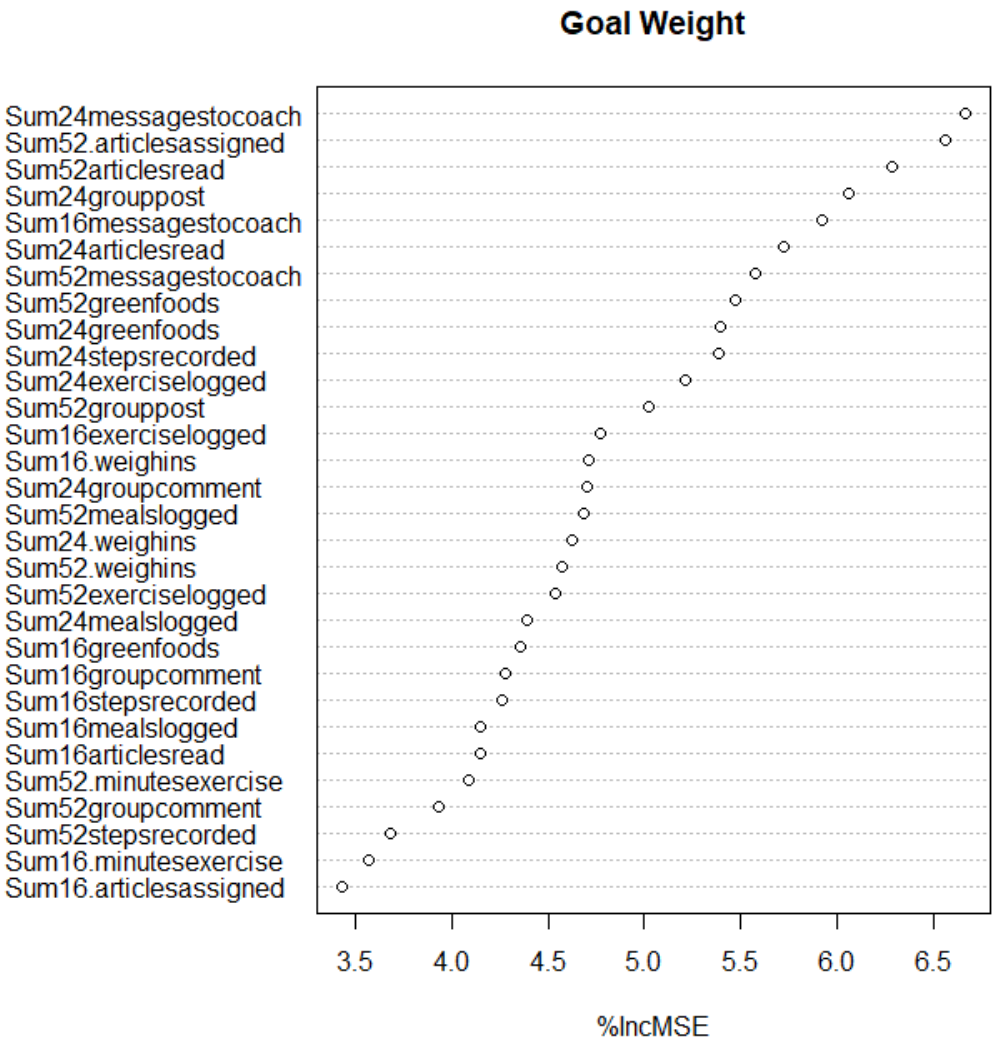
Signicance Testing

```
rf.perm <- rf.significance(rf, DF.t, q = 0.99, p = 0.05, nperm=99, ntree=25)
rf.perm

## Number of permutations:  99
## p-value:  0.01
## Model signifiant at p = 0.01
##   Model R-square:  -0.1020314
##   Random R-square:  -0.3022534
##   Random R-square variance:  0.0002932924
```

Variable Importance Plot

```
varImpPlot(rf, type = 1, main = "Goal Weight")
```



Multiple Regression 5

Differnce in BMI

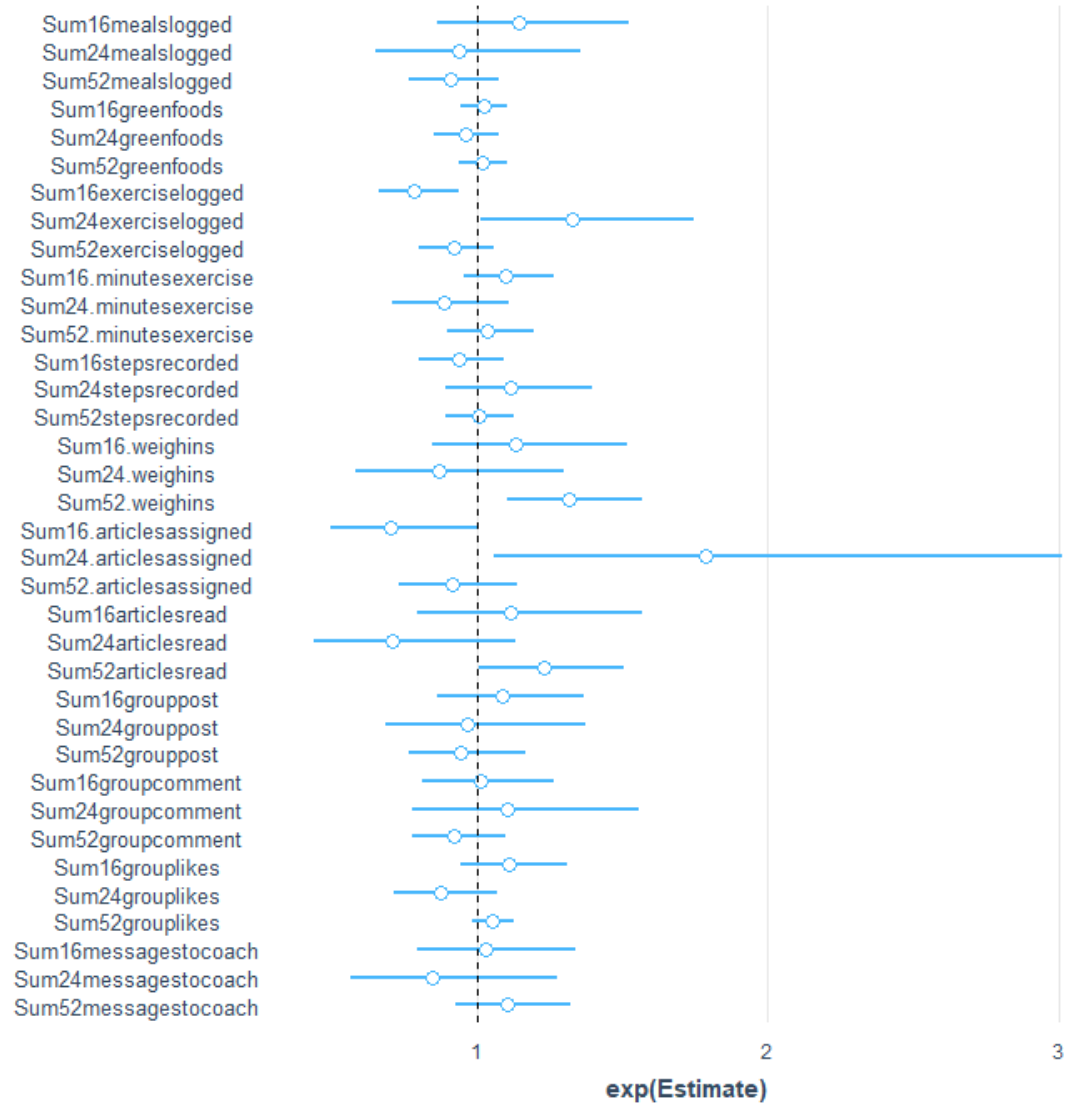
```
DF <- read.csv("C:/Users/LaoTz/Desktop/DF Articles/WeightLoss.csv", header =
TRUE)
DF <- na.omit(DF)
DF.t <- DF[-c(36,37,56)]
DF.t <- DF.t[c(14,4,7,15,16,17:53)]
DF.t <- DF.t[c(1,7:42)]
DF.t = scale(DF.t, center = TRUE, scale = TRUE)
DF.t <- as.data.frame(DF.t)
reg <- lm(BMIDifference ~., DF.t)
```

MODEL INFO:
Observations: 7138
Dependent variable: BMIDifference
Type: OLS linear regression

MODEL FIT:
$F(36,7101) = 21.36$, $p = 0.00$
$R^2 = 0.10$
Adj. $R^2 = 0.09$

Standard errors: OLS

	Est.	2.5%	97.5%	t val.	p	partial.r	part.r
(Intercept)	-0.00	-0.02	0.02	-0.00	1.00		
Sum16mealslogged	0.14	-0.11	0.38	1.09	0.28	0.01	0.01
Sum24mealslogged	-0.06	-0.40	0.27	-0.38	0.70	-0.00	-0.00
Sum52mealslogged	-0.10	-0.25	0.05	-1.32	0.19	-0.02	-0.01
Sum16greenfoods	0.02	-0.05	0.09	0.56	0.58	0.01	0.01
Sum24greenfoods	-0.04	-0.14	0.05	-0.89	0.37	-0.01	-0.01
Sum52greenfoods	0.02	-0.05	0.08	0.48	0.63	0.01	0.01
Sum16exerciselogged	-0.24	-0.42	-0.06	-2.67	0.01	-0.03	-0.03
Sum24exerciselogged	0.28	0.02	0.55	2.12	0.03	0.03	0.02
Sum52exerciselogged	-0.09	-0.21	0.04	-1.34	0.18	-0.02	-0.02
Sum16.minutesexercise	0.09	-0.06	0.24	1.21	0.22	0.01	0.01
Sum24.minutesexercise	-0.12	-0.33	0.09	-1.12	0.26	-0.01	-0.01
Sum52.minutesexercise	0.03	-0.08	0.14	0.58	0.56	0.01	0.01
Sum16stepsrecorded	-0.07	-0.20	0.07	-0.98	0.33	-0.01	-0.01
Sum24stepsrecorded	0.11	-0.08	0.30	1.12	0.26	0.01	0.01
Sum52stepsrecorded	0.00	-0.09	0.10	0.05	0.96	0.00	0.00
Sum16.weighins	0.12	-0.01	0.26	1.75	0.08	0.02	0.02
Sum24.weighins	-0.14	-0.33	0.04	-1.52	0.13	-0.02	-0.02
Sum52.weighins	0.27	0.19	0.35	6.69	0.00	0.08	0.08
Sum16.articlesassigned	-0.36	-0.61	-0.10	-2.69	0.01	-0.03	-0.03
Sum24.articlesassigned	0.58	0.21	0.95	3.07	0.00	0.04	0.03
Sum52.articlesassigned	-0.09	-0.26	0.07	-1.09	0.28	-0.01	-0.01
Sum16articlesread	0.11	-0.17	0.39	0.75	0.46	0.01	0.01
Sum24articlesread	-0.35	-0.75	0.05	-1.73	0.08	-0.02	-0.02
Sum52articlesread	0.21	0.03	0.39	2.25	0.02	0.03	0.03
Sum16grouppost	0.08	-0.10	0.26	0.87	0.38	0.01	0.01
Sum24grouppost	-0.03	-0.29	0.22	-0.26	0.80	-0.00	-0.00
Sum52grouppost	-0.06	-0.17	0.05	-1.02	0.31	-0.01	-0.01
Sum16groupcomment	0.01	-0.21	0.23	0.11	0.91	0.00	0.00
Sum24groupcomment	0.10	-0.25	0.44	0.54	0.59	0.01	0.01
Sum52groupcomment	-0.08	-0.25	0.09	-0.96	0.34	-0.01	-0.01
Sum16grouplikes	0.10	-0.06	0.27	1.23	0.22	0.01	0.01
Sum24grouplikes	-0.14	-0.37	0.09	-1.17	0.24	-0.01	-0.01
Sum52grouplikes	0.05	-0.04	0.15	1.05	0.29	0.01	0.01
Sum16messagestocoach	0.03	-0.17	0.23	0.30	0.77	0.00	0.00
Sum24messagestocoach	-0.17	-0.46	0.13	-1.12	0.26	-0.01	-0.01
Sum52messagestocoach	0.10	-0.04	0.23	1.43	0.15	0.02	0.02



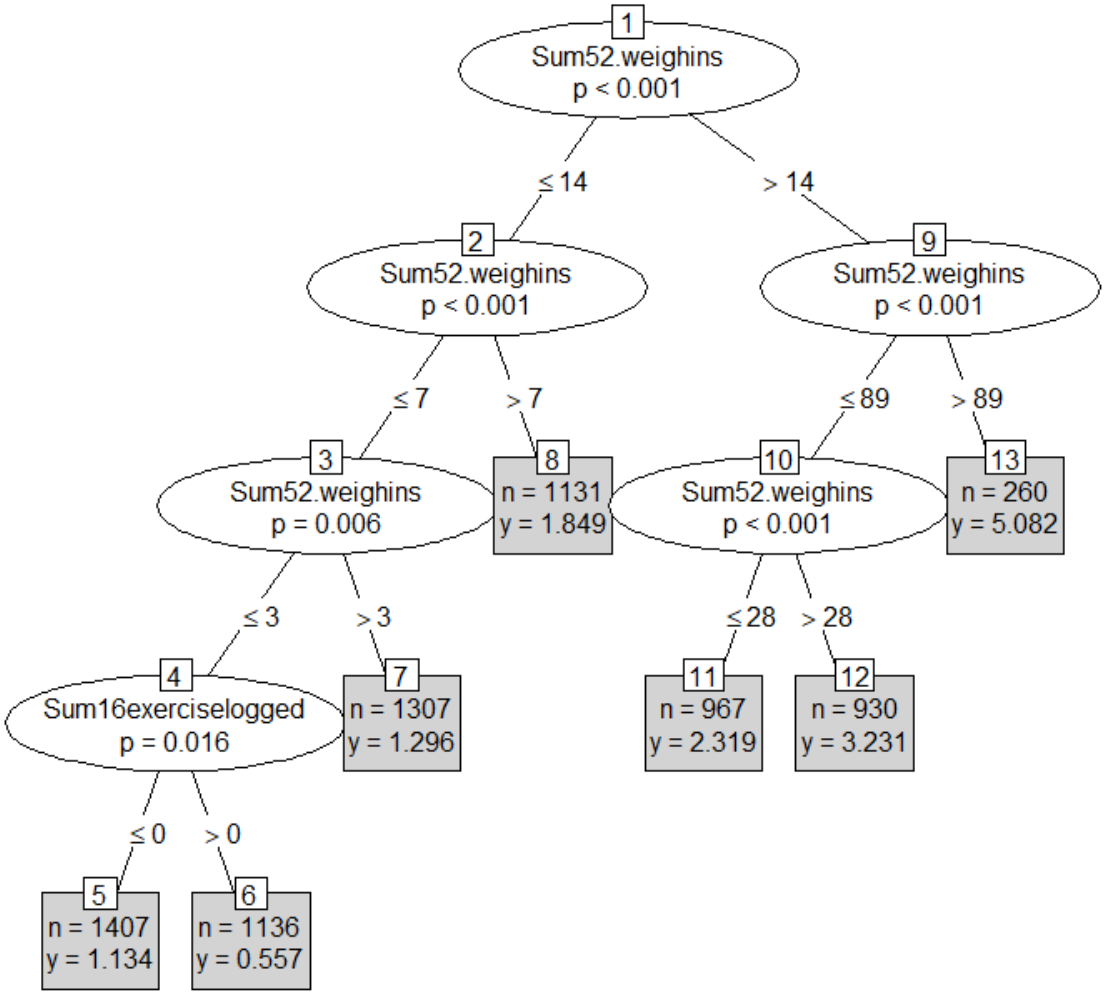
Regression Tree 5

```
DF <- read.csv("C:/Users/LaoTz/Desktop/DF Articles/WeightLoss.csv", header =
TRUE)
DF <- na.omit(DF)
DF.t <- DF[-c(36,37,56)]
DF.t <- DF.t[c(14,4,7,15,16,17:53)]
DF.t <- DF.t[c(1,7:42)]
model <- train(
  BMIDifference ~., DF.t, method = "ctree",
  trControl = trainControl("cv", number = 10),
  tuneGrid = expand.grid(mincriterion = 0.95)
)
model$results
```

```
##   mincriterion     RMSE  Rsquared      MAE    RMSESD RsquaredSD    MAESD
## 1         0.95 2.929413 0.1035828 1.520297 0.2932742 0.03670426 0.069854
```

Tree Model

```
plot(model$finalModel, type = "simple")
```



User Engagement and Change in BMI for 7 Terminal Nodes (Left to Right)

1	Diff BMI avg 1.13 = **WK 52 Weigh-ins ≤ 3, WK 16 Exercise Logged ≤ 0**
2 Low	Diff BMI avg 0.58 = **WK 52 Weigh-ins ≤ 3, WK 16 Exercise Logged > 0**
3	Diff BMI avg 1.30 = **WK 52 Weigh-ins >3 & ≤ 7**
4	Diff BMI avg 1.85 = **WK 52 Weigh-ins ≤ 14 & > 7**
5	Diff BMI avg 2.32 = **WK 52 Weigh-ins > 14 & ≤ 28**

6	Diff BMI avg 3.23 = **WK 52 Weigh-ins > 28 & ≤ 89**
7 High	Diff BMI avg 5.08 = **WK 52 Weigh-ins > 89**

Random Forest 5

```
DF <- read.csv("C:/Users/LaoTz/Desktop/DF Articles/WeightLoss.csv", header =
TRUE)
DF <- na.omit(DF)
DF.t <- DF[-c(36,37,56)]
DF.t <- DF.t[c(14,4,7,15,16,17:53)]
DF.t <- DF.t[c(1,7:42)]
rf <- randomForest(BMIDifference ~ ., data = DF.t, ntree = 25,
                   mtry = 4, nodesize = 5, importance = TRUE)
```

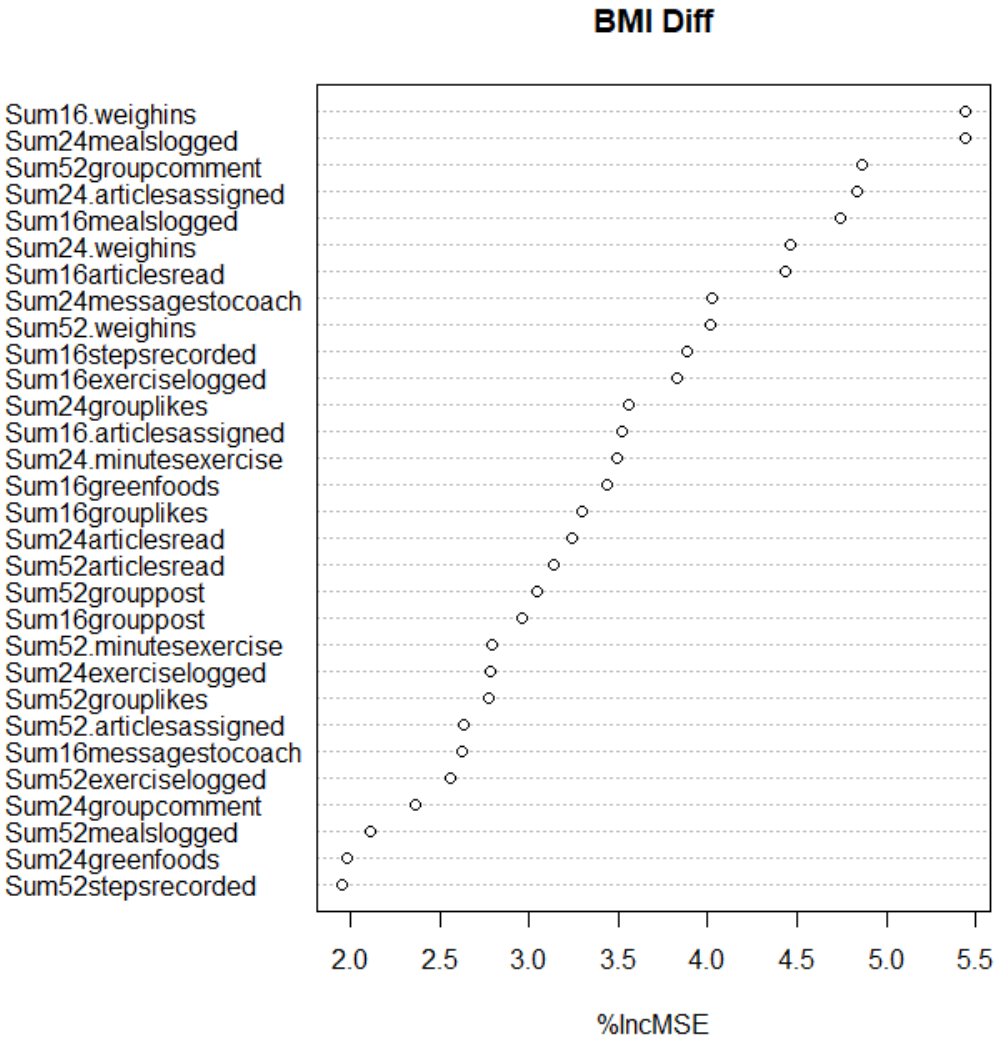
Signicance Testing

```
rf.perm <- rf.significance(rf, DF.t, q = 0.99, p = 0.05, nperm=99, ntree=25)
rf.perm

## Number of permutations:  99
## p-value:  0.01
## Model signifiant at p = 0.01
##   Model R-square:  -0.09295715
##   Random R-square:  -0.3097367
##   Random R-square variance:  0.0004561746
```

Variable Importance Plot

```
varImpPlot(rf, type = 1, main = "BMI Diff")
```


BMI Diff
Sum16.weighins
Sum24mealslogged
Sum52groupcomment
Sum24.articlesassigned
Sum16mealslogged
Sum24.weighins
Sum16articlesread
Sum24messagestocoach
Sum52.weighins
Sum16stepsrecorded
Sum16exerciselogged
Sum24grouplikes
Sum16.articlesassigned
Sum24.minutesexercise
Sum16greenfoods
Sum16grouplikes
Sum24articlesread
Sum52articlesread
Sum52grouppost
Sum16grouppost
Sum52.minutesexercise
Sum24exerciselogged
Sum52grouplikes
Sum52.articlesassigned
Sum16messagestocoach
Sum52exerciselogged
Sum24groupcomment
Sum52mealslogged
Sum24greenfoods
Sum52stepsrecorded
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
%IncMSE